Unit 4 (Optics) Test (Version 2) **Name: _____**

Multiple Choice

1. A transparent substance has an index of refraction of 1.42. How fast does light pass through this substance?

a) 1.4×10^8 m/s
b) 2.1×10^8 m/s
c) 3.0×10^7 m/s
d) 6.3×10^8 m/s

2. The focal length of a concave mirror is:

a) 0
b) the distance to the centre of curvature, *C*
c) positive
d) negative

3. What is a concave mirror?

a) It is a mirror that has a reflecting surface that curves outward.
b) It is a mirror with a flat reflecting surface.
c) It is a mirror that has a reflecting surface that curves inward.
d) It is a type of mirror that creates an image identical to the object in terms of orientation, size, and location.

4. Phosphors absorb what kind of radiation and re-emit it as visible light?

a) Microwave
b) Infrared
c) Visible
d) Ultraviolet
e) X-Ray

5. A convex mirror that has a centre of curvature at 8 cm has a focal length of how long?

a) 4 cm
b) 8 cm
c) -8 cm
d) -4 cm

6. When the image is behind a convex mirror, what is the value of the image distance in the mirror equation?

a) The image distance, d_i, is positive.
b) The image distance, d_i, is negative.
c) The image distance, d_i, is exactly zero.
d) An image cannot appear behind a concave mirror.

7. What does a negative value of h_i represent?

a) inverted image
b) upright image
c) real image
d) virtual image

8. What does a negative value of d_i represent?

a) inverted image
b) upright image
c) real image
d) virtual image

9. What does a negative focal length represent?

a) convex mirror
b) concave mirror
c) negative index of refraction
d) index of refraction greater than 1

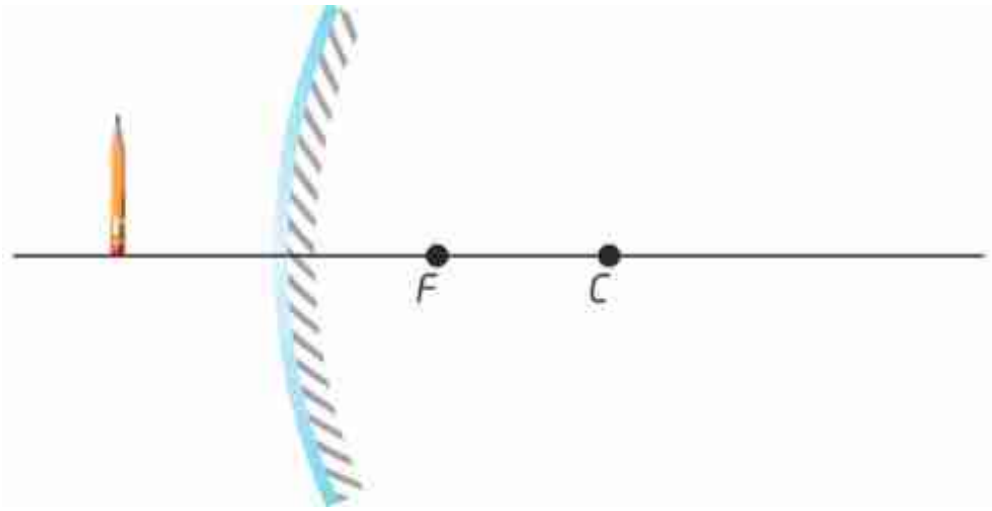
10. Which word refers to light that is produced by a high-temperature object?

a) Fluorescence
b) Bioluminescence
c) Incandescence
d) Phosphorescence
e) Chlorescence

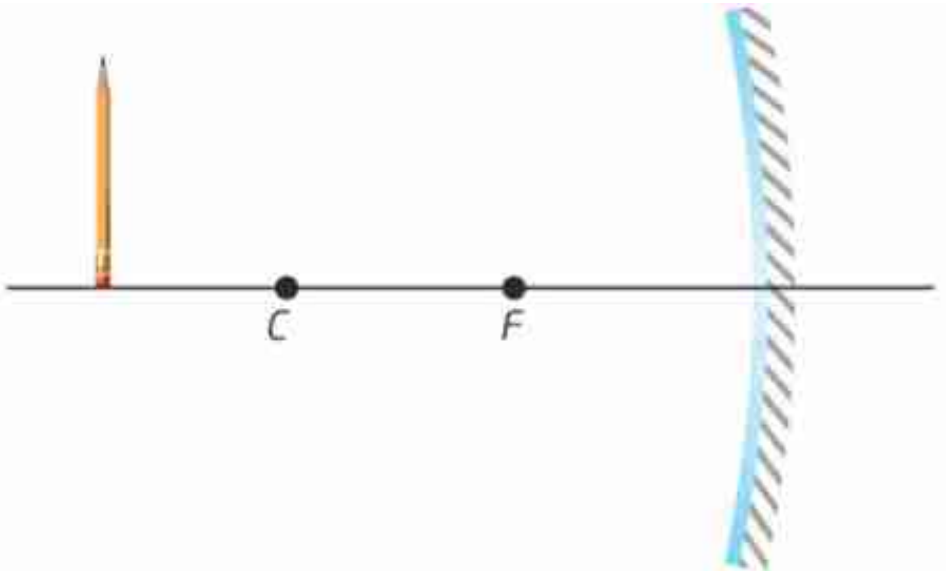
11. The lighting of a firefly is an example of what?

a) Fluorescence
b) Bioluminescence
c) Incandescence
d) Phosphorescence
e) Chlorescence

12. Using the diagram below, draw the appropriate incident and reflected rays to help you predict where the image will lie. Be clear about where the image is!

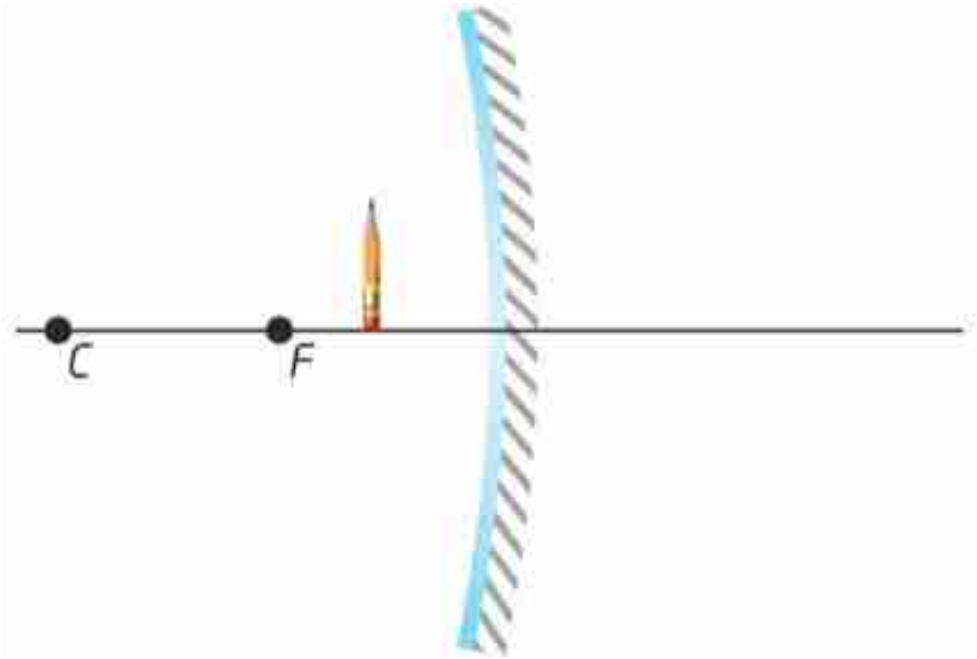


13. Using the diagram below, draw the appropriate incident and reflected rays to help you predict where the image will lie. Be clear about where the image is!



14.

a) Using the diagram below, draw the appropriate incident and reflected rays to help you predict where the image will lie. Be clear about where the image is! The focal length is 5 cm. The pencil is 3 cm tall and is standing 3 cm away from the mirror.



b) Circle the appropriate description for each characteristic of the image from 14(a).

Image Location	Closer to mirror		Farther from mirror
Image height (compared to object)	Larger	Equal	Smaller
Orientation	Inverted		Upright
Image Type	Real		Virtual

c) Use the mirror equation to determine the image distance in 16(a).

d) Use the magnification equation to determine the image height in 16(a).

17. Explain what causes any <u>one</u> of the following phenomena. Include a diagram with your explanation if you like. Make sure to include the words “light rays” and “refraction” in your explanation.

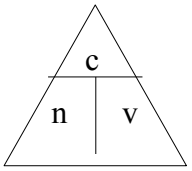
Mirages
Shimmering
Rainbows
Apparent Depth
Total Internal Reflection

18. A convex security mirror in a warehouse has a focal length of of -0.5 m. A 2 m tall forklift is parked 6 m from the mirror.

a) the image distance

c) the height of the image

Formulas $n = \frac{c}{v}$ c = 3.0 x 10^8 m/s



Mirror Equation

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

f is the focal length (negative for convex mirror

d_o is the object distance (how fa the actual object is from the mirror)

d_i is the image distance (how far the image of the object is from the mirror). Negative if the image is behind the mirror.

$$f = \frac{d_i + d_o}{d_i d_o}$$

$$d_i = \frac{d_o - f}{d_o f}$$

$$d_o = \frac{d_i - f}{d_i f}$$

Magnification Equation

$$m = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$$

m is the magnification

d_o is the object distance

d_i is the image distance (negative if the image is behind the mirror)

h_o is the object height

h_i is the image height (negative if the image is inverted)

$$h_i = \frac{-d_i h_o}{d_o} \qquad h_o = \frac{-h_i d_o}{d_i}$$

$$d_i = \frac{-h_i d_o}{h_o} \qquad d_o = \frac{-d_i h_o}{h_i}$$